Spatial Structures in the Social Sciences
2025 Winter GIS Institute

Final Presentation Program

January 17, 2025

PSTC Seminar Room (Mencoff Hall 205)
68 Waterman Street, Providence RI 02912

9:30 – 10:00 am	Brunch & **Opening Remarks**
10:00 am – 10:20 am	**Session I:** Historical GIS
10:20 am – 12:00 pm	**Session II:** GIS in Society I
12:00 – 1:00 pm	**Lunch**
1:00 – 1:40 pm	**Session III:** GIS and Health
1:40 – 2:40 pm	**Session IV:** GIS in Society II
2:40 – 3:00 pm	Certificate Presentation & **Closing Remarks**

PARTICIPANTS

Débora Duque (Political Science)

Elly Field (Population Studies and Training Center)

Alyssa Iurillo (Department of Dermatology | Warren Alpert Medical School)

Lucy Li (Economics)

Annie Maloney (History of Art & Architecture)

Alex Perullo (Anthropology | Bryant University)

Archana Ramanujam (Sociology)

Alexandra Steinberg (Athletics)

Asad Tariq (Economics)

Liangdi Xu (Sociology)

Shanni Zhao (Watson Institute for International and Public Affairs)

PROGRAM

SESSION I:

HISTORICAL GIS

[10:00am] Annie Malonie, *Mapping Memorie: Using ArcGIS to Analyze Archaeological Records in Early Modern Rome*

SESSION II:

GIS IN SOCIETY I

[10:20am] Asad Tariq, *Polygon Politics: Compactness Analysis of the Indian Delimitation*

[10:40am] Shanni Zhao, *Inquiries into the Relationship between Marriage Rates and Domestic Residential Status in China*

[11:00am] Liangdi Xu, *New Urban Light Rail Lines and Neighborhood Changes*

[11:20am] Débora Duque, *Taking the Right Turn? Land Rights and Electoral Behavior in Rural Communities of the Brazilian Amazon*

[11:40am] Archana Ramanujam, *Characterizing Crashes: Advocating for Safer Streets in Providence, RI*

LUNCH BREAK, 12:00 PM – 1:00 PM

SESSION III:

GIS AND HEALTH

[1:00pm] Alyssa Iurillo, *An Analysis of Melanoma Incidence and Building Height in the United States*

[1:20pm] Alex Perullo, *Using Data Visualization to Address Social Determinants of Health Among African Immigrants in Rhode Island*

SESSION IV:

GIS IN SOCIETY II

[1:40pm] Elly Field, *Rolling Brown Back: The Impacts of Releasing Desegregation Orders on School Zones & Racial Segregation*

[2:00pm] Lucy Li, *The Link Between SNAP and Eviction Filings*

[2:20pm] Alexandra Steinberg, *Exploring Code Violations and Housing-Related Health Conditions in Providence, RI*

PRESENTATION ABSTRACTS

Débora Duque – Taking the Right Turn? Land Rights and Electoral Behavior in Rural Communities of the Brazilian Amazon

This project explores the relationship between the expansion of land rights and voting behavior among rural marginalized communities in the Brazilian Amazon. While the formalization of land property rights has historically been a central demand of peasant and traditional communities, growing evidence points to the unintended consequences of these policies, including displacement and political demobilization. Using GIS, this study examines the issuance of land titles and its association with electoral behavior across approximately 1,500 communities over multiple election cycles. By integrating data on community boundaries with the geolocation of polling stations, I calculate community-level voting patterns to assess variation across a range of electoral outcomes.

Elly Field – Rolling *Brown* Back: The Impacts of Releasing Desegregation Orders on School Zones & Racial Segregation

Following Brown v. Board of Education (1954, 1955), hundreds of court cases were filed against school districts to compel action on desegregating schools. Across the country, these cases resulted in school districts being placed under desegregation orders to proactively address racial segregation in schools using strategies including busing students between neighborhoods and re-configuring school attendance boundaries to increase racial integration. However, after Board of Education v. Dowell (1991), these desegregation orders began to be lifted over the 1990s and 2000s. I use the Prince George's County School District as a case study to examine changes to school attendance boundaries and school racial segregation before and after the release of a court-ordered desegregation plan. First, I use geospatial analyses used for measuring gerrymandering to examine how the spatial character of school attendance zones changes after the release of a desegregation order. Second, I conduct a counter-factual analysis to examine how the racial composition and segregation of Prince George County schools might have differed if the desegregation order had not been released and school attendance boundaries had not changed between 2000 and 2010. Finally, I compare the 2000 and 2010 attendance boundaries to a Thiesson polygon analysis to investigate whether and how these attendance boundaries may be either increasing or reducing racial segregation in PGCSD schools.

Alyssa Iurillo – An Analysis of Melanoma Incidence and Building Height in the United States

Melanoma is the deadliest form of skin cancer, with nearly 20 Americans dying from it each day. While UV exposure is a well-documented risk factor, the potential influence of urban design, particularly building height, on melanoma incidence remains underexplored. Tall structures in urban environments create "shadow zones" that reduce direct sun exposure, potentially mitigating melanoma risk. This study examines the relationship between building height and melanoma incidence across Metropolitan Statistical Areas (MSAs) in the United States from 1999 to 2021. Data for this analysis were aggregated using ArcGIS Pro, with MSA shapefiles ensuring a consistent urban focus. Melanoma incidence data were sourced from the CDC WONDER database at the MSA level, covering all ages and sexes. Building height data were obtained from the Shuttle Radar Topography Mission, focusing on very high, high, and medium-high buildings. The total area covered by these buildings within each MSA was calculated in square miles. Only buildings located in MSAs with available melanoma data were included in the analysis. UV exposure data—specifically the annual average UV irradiance at noon, measured in milliwatts per square meter (mW/m^2)—were sourced from the National Environmental Public Health Tracking Network for 2020, the most recent year available. These UV data were collected at the county level and aggregated to align with MSA

boundaries. A regression analysis, controlling for UV exposure, revealed a significant negative correlation between melanoma incidence and building height, with a regression coefficient of -0.017106 and a p-value of 0.001993. This finding suggests that greater building height, and consequently larger shadow zones, is associated with reduced melanoma incidence. These results underscore the potential for urban planning and architectural design to influence public health outcomes. By incorporating considerations of shadow zones and UV exposure into city planning, it may be possible to complement traditional melanoma prevention strategies and offer innovative ways to reduce risk in urban populations.

Lucy Li – The Link Between SNAP and Eviction Filings

This project examines the relationship between changes in Supplemental Nutrition Assistance Program (SNAP) benefits and eviction filing measures. Food and housing insecurity are interconnected but still it is not immediate how a change in SNAP benefits affects eviction filings. Increases in benefits may allow households to transfer income from buying food to paying rent, decreasing the likelihood of a rent default and thus decreasing the likelihood of an eviction filing. In contrast, an increase in benefits may concurrently improve landlords' outside options in the low-income rental market, increasing the likelihood of a landlord filing an eviction. Looking at the staggered ending across states of SNAP Emergency Allotments (EAs), which allocated at least $95 a month more in SNAP benefits to households due to the COVID-19 pandemic, we examine initial empirical evidence on the association between SNAP benefits and eviction filings. We also visualize the differences in eviction filing measures pre- and post-ending of SNAP EAs along with the percent of households with SNAP.

Annie Maloney – Mapping *Memorie*: Using ArcGIS to Analyze Archaeological Records in Early Modern Rome

Throughout the early modern period, Roman antiquarians frequently produced lists of *memorie*, written descriptions the most exciting archaeological discoveries that occurred in the city during their lifetime. Lists of *memorie* written between the 15th and 18th centuries are currently scattered across unpublished manuscripts, early modern books, and archaeological journals. In this project, I chart the 156 *memorie* written by the artist-antiquarian Pietro Santi Bartoli (1635-1700) using early modern maps of Rome, as well as Rodolfo Lanciani's 1901 *Forma Urbis*, and modern GIS records of archaeological from the Soprintendenza Speciale Archaeologica Belle Arti e Paesaggio di Roma (SITAR). Pietro Santi Bartoli dedicated his career making visual and written records of excavation sites across Rome and saved several ancient tombs from destruction at the hands of careless workmen and greedy collectors. His etchings and watercolor reproductions of ancient frescoes and artifacts continue to serve as valuable records for lost or damaged sites. By comparing Bartoli's *memorie* to both published and unpublished excavation licenses from the Archivio di Stato Roma (ASR) and creating a digital geographical model through which to analyze Bartoli's various antiquarian projects, I address research questions about findspots for valuable ancient artifacts, archaeological activity in the 17th century, and the location of lost excavation sites in the city of Rome.

Alex Perullo – Using Data Visualization to Address Social Determinants of Health Among African Immigrants in Rhode Island

Many of the 55,000 African immigrants living in Rhode Island reside in South Providence. Ethnographic research among this population over the past twenty years has highlighted recurring themes, including the adverse effects of limited access to nutritious food, financial instability, substandard living conditions, and inadequate educational opportunities in neighborhood schools. These factors—food security, economic stability, housing quality, and educational opportunities—are key components of Social Determinants of Health (SDOH), a concept that examines how social, economic, and environmental conditions influence individual and population health outcomes. Working with the African Alliance of Rhode Island (AARI), the largest advocacy organization aimed at assisting the African populations in the state, this research aims to generate materials that answers key questions about SDOH among the African immigrant population. In particular, this project focuses on answering two questions: Does the data collected by the US Census, the American Community Survey (ACS), and other sources validate the concerns of the African immigrant community regarding SDOH? And, can GIS mapping be used to inform policy interventions to better assist the African communities living in Rhode Island? Initial findings reveal that many of the SDOH-related issues encountered by the African immigrant population are also captured in existing datasets. This presents an opportunity to create visualized representations of the data, which can then serve as a means to advocate for policy reforms that enhance the well-being of the African community in Rhode Island.

Archana Ramanujam – Characterizing Crashes: Advocating for Safer Streets in Providence, RI

This project seeks to characterize the pattern of pedestrian and bike crashes in Providence, RI, so that Providence Streets Coalition, a street safety organization, can advocate accordingly. It has two to three strands of inquiry. First, it will identify and characterize clusters where crashes occur more frequently city, and the roads or areas that they most commonly occur on, so that we know which areas to focus on. It will attempt to characterize this by contextualizing the data with traffic counts, but also through statistical and neighborhood analysis. Second, in this project I look at crash proximity to schools, because there is a proposition to increase the radius around schools where speeding cameras are placed, and we want to know how crashes are organized around schools. Third, I will look at whether crashes occur more frequently on roads operated by the state transportation authority as compared to the city.

Alexandra Steinberg – Exploring Code Violations and Housing-Related Health Conditions in Providence, RI

Housing conditions can significantly impact residents' health, and code enforcement is one mechanism to ensure that residential buildings meet minimum health and safety standards. However, how code enforcement is designed can affect its ability to achieve these goals. Code enforcement in Rhode Island and most of the U.S. is a complaint-based process, which makes the resident responsible for reporting, puts tenants at risk of retaliation, and may lead to underreporting. Additionally, studies demonstrate that reactive and punitive code enforcement processes often have disproportionate and harmful responses for residents of color and those with lower incomes, who are also likely to live in neighborhoods of historic disinvestment. Throughout the country and in Providence, advocates are pushing for more proactive and strategic code enforcement (such as, all

homes are inspected at a certain frequency and different remedies depending on the property and owner) to more effectively use code enforcement resources, improve housing conditions, and minimize harm to tenants. Recognizing that lower-income homeowners may not have the funds to repair their homes, Providence and Rhode Island recently funded home repair programs for lower-income owners who have homes with code violations. To facilitate more informed conversations about the future of code enforcement, this research explores Providence's geographic distributions of code violations, housing-related health conditions, and home repair programs, along with income, race, and ethnicity.

Asad Tariq – Polygon Politics: Compactness Analysis of the Indian Delimitation
The manipulation of electoral boundaries for partisan advantage, known as gerrymandering, has substantial implications for democratic representation. To analyze the phenomenon of gerrymandering in the Indian context, I examine the compactness of polygons of electoral constituencies before and after the 2008 delimitation exercise. I employ quantitative measures of compactness, such as the Polsby-Popper and Schwartzberg indices, to identify systematic deviations from geometrically optimal shapes by utilizing a dataset of polygonal boundaries of constituencies pre and post 2008 delimitation. It could be possible that the constituencies that are less compact may be indicative of intentional boundary manipulation in order to influence electoral outcomes. My project aims to demonstrate the presence of compactness patterns in various states and regions, with variations attributed to demographic, political, and geographic factors. This study contributes to the global discourse on electoral fairness by concentrating on India, providing a perspective on the neutrality and efficacy of the delimitation process in the world's largest democracy.

Liangdi Xu – New Urban Light Rail Lines and Neighborhood Changes
Are new urban light rail lines associated with changes in neighborhoods close to them? Over the past few decades, thanks to increasing environmental awareness and the recognition that the capacity for automobile-related infrastructure is nearing saturation, there has been more investment into public transportation. At the same time, declining federal funding for cities has led many cities to gravitate towards light rail as an affordable option for public transportation development. Scholarly attention has thus turned towards its effect on nearby neighborhoods. Access to public transportation could be a beneficial resource for local residents, helping them reach employment centers and reduce spending on personal automobiles, but it could also lead to gentrification, since public transportation is an attractive amenity. Much has already been written about growing property values as a result of new light rail lines, but results on the humans living on these properties are less clear. Interpretations of gentrification also tend to vary significantly (for a summary, see Brown-Saracino 2017). In this exploratory analysis, I break down gentrification into two categories of variables: measures of socio-economic statuses (SES) and measures of residential churning (RC), extracted from the Longitudinal Tract Data Base (LTDB). Since most literature has focused on light rail lines constructed between 1970 and 2000, I pick four cases from the early 2000s: Seattle's 1 Line, San Francisco's T Third Street, Houston's Red Line and Denver's Southeast Corridor. Analyzing how census tracts within 30-minutes' walking distance of these light rail stations have changed between 2000 and 2012, I show how measures of SES and RC can produce different spatial concentrations. Mapping also reveals variations of the effects of light rail lines in different cities, depending on whether these lines mostly serve the urban population or as a commuting option for suburban riders. Census tracts located closer to the urban center may experience stronger gentrification processes. Local contexts of whom and what the light rail lines are serving seem to result in varying trends of neighborhood changes.

Shanni Zhao – Inquiries Into the Relationship between Marriage Rates and Domestic Residential Status in China

In China, *hukou,* or the national residence registration system, divides the population within each administrative unit into "permanent residents" and "temporary residents." For those from either category and staying in the region for more than 6 months, they are categorized as "regular residents" in the national census. This division creates differentiation favors the permanent residents; it directly influences people's access to local governmental welfare provision, services (including marriage registration), and job opportunities, and therefore the general life chances to achieve well-being. As domestic migration rapidly increases, the hukou policy has created hurdles preventing people from freely choosing where to live, and where to establish a family and raise children. Meanwhile, the national marriage rates have experienced a continuous decrease over the last decade. Despite the general decrease, there is often a difference between the marriage rates among permanent residents and those among regular residents in each province. The difference varies by province: some provinces have higher marriage rates among permanent residents, while others show the opposite trend. With ArcGIS, I explore and analyze how the difference is distributed in China across provinces; why residence status has a bigger influence on the population's marriage rates in some provinces than in others; what economic and policy conditions might contribute to this distribution.